MULTILAYERED RESIST SYSTEMS USING TUNED POLYMER FILMS AS UNDERLAYERS AND METHODS OF FABRICATION THEREOF

Abstract

Disclosed are multilayered resist structures including bilayer and top surface imaging which utilize tuned underlayers functioning as ARCs, planarizing layers, and etch resistant hard masks whose properties such as optical, chemical and physical properties are tailored to give a multilayer resist structure exhibiting high resolution, residue free lithography and methods of preparing these materials. These underlayer films include the group consisting of novolac based resists whose processing conditions are controlled,, polyarylsulfones such as the BARL material, polyhydroxystyrene based derivatives, an example being a copolymer of polyhydroxystyrene and polyhydroxystyrene reacted with anthracenemethanol that contains a cross-linker, and acid catalyst (thermal acid generator), polyimides, polyethers in particuar polyarylene ethers, polyarylenesulfides, polycarbonates such as polyarylenecarbonates, epoxies, epoxyacrylates, polyarylenes such as polyphenylenes, polyarylenevinylenes such as polyphenylenevinylenes, polyvinylcarbazole, cyclicolefins, and polyesters. Such films have index of refraction and extinction coefficient tunable from about 1.4 to about 2.1 and from about 0.1 to about 0.6 at UV and DUV wavelengthts, in particular 365, 248, 193 and 157nm and EUV. Moreover, underlayer films produced in the present invention do not interact with the resist limiting interfacial mixing and contamination of resist by an outgassing product. The bilayer and TSI resist structures can be used for 248, 193, 157, EUV, x-ray, e-beam, and ion beam technology.